

Undergraduate Research Spring 2012

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December 2, 2011

CRL (Computing Research Lab)

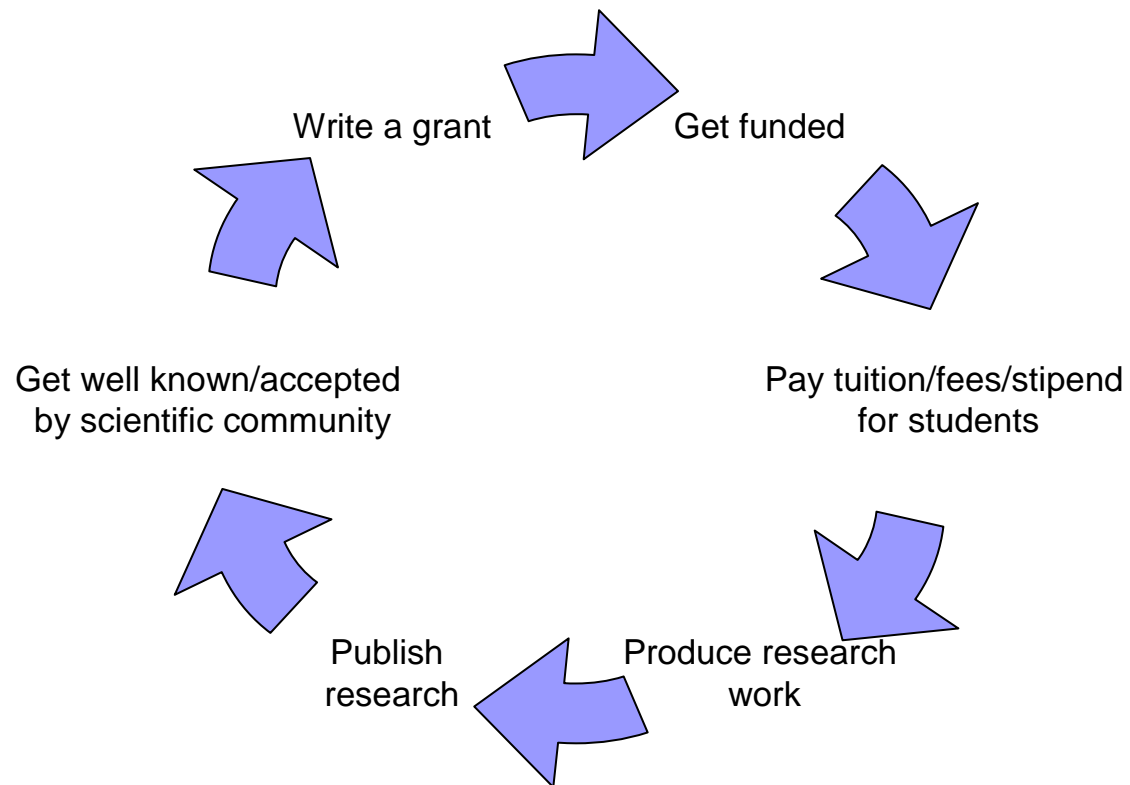
2:30pm



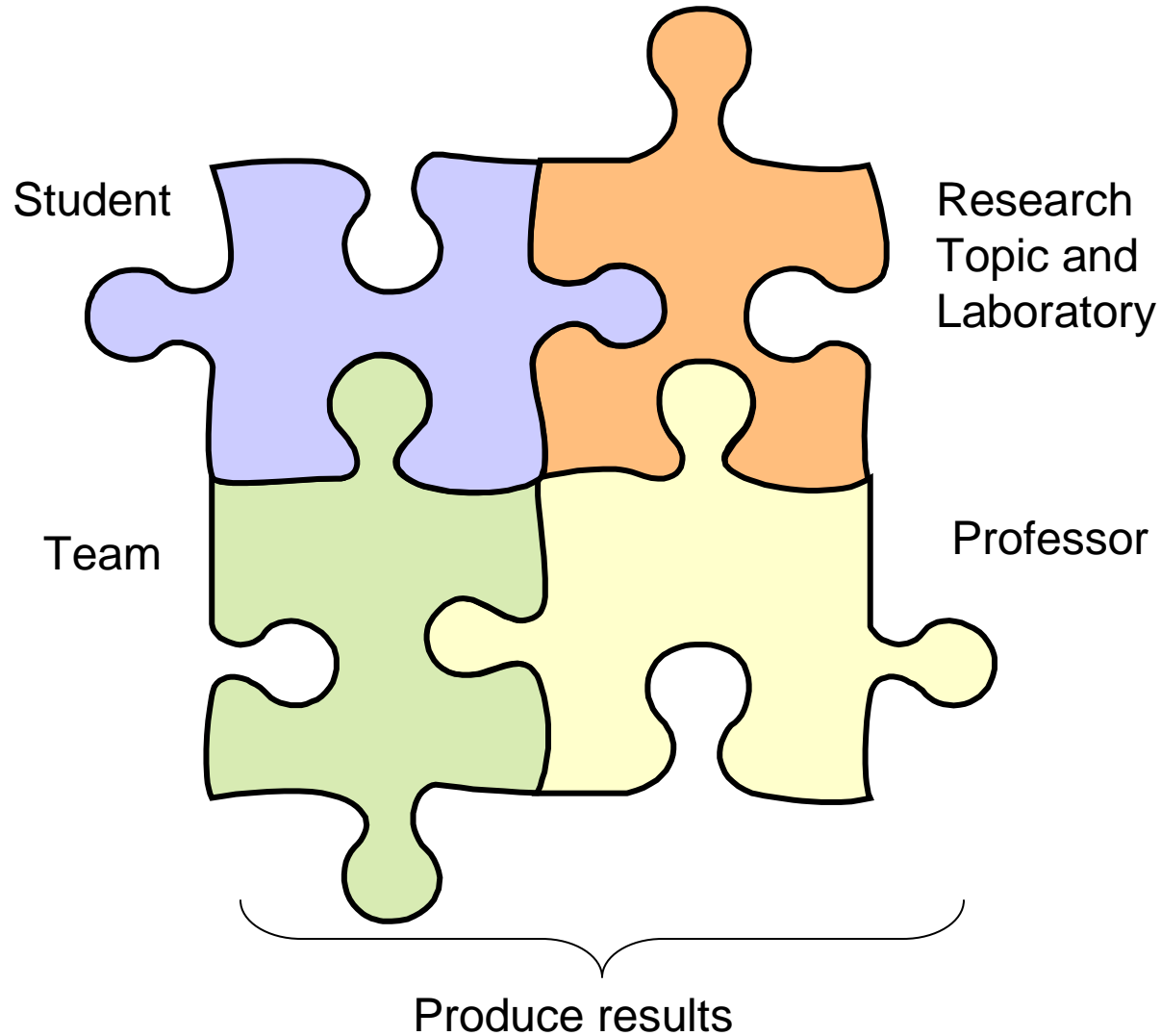
What is Undergraduate Research?

- Undergraduate research refers to independent original investigations conducted by undergraduates.
 - Assisting professors with their research.
 - Same skills as graduate research but with more supervision and less scale of contribution.
- Graduate Research
 - Produce original research
 - Defense
 - Broad research abilities
 - Communication – write, present, talk
 - Experimentation
 - Scholarship
 - highest standards of integrity, accountability, and responsibility
 - Funding

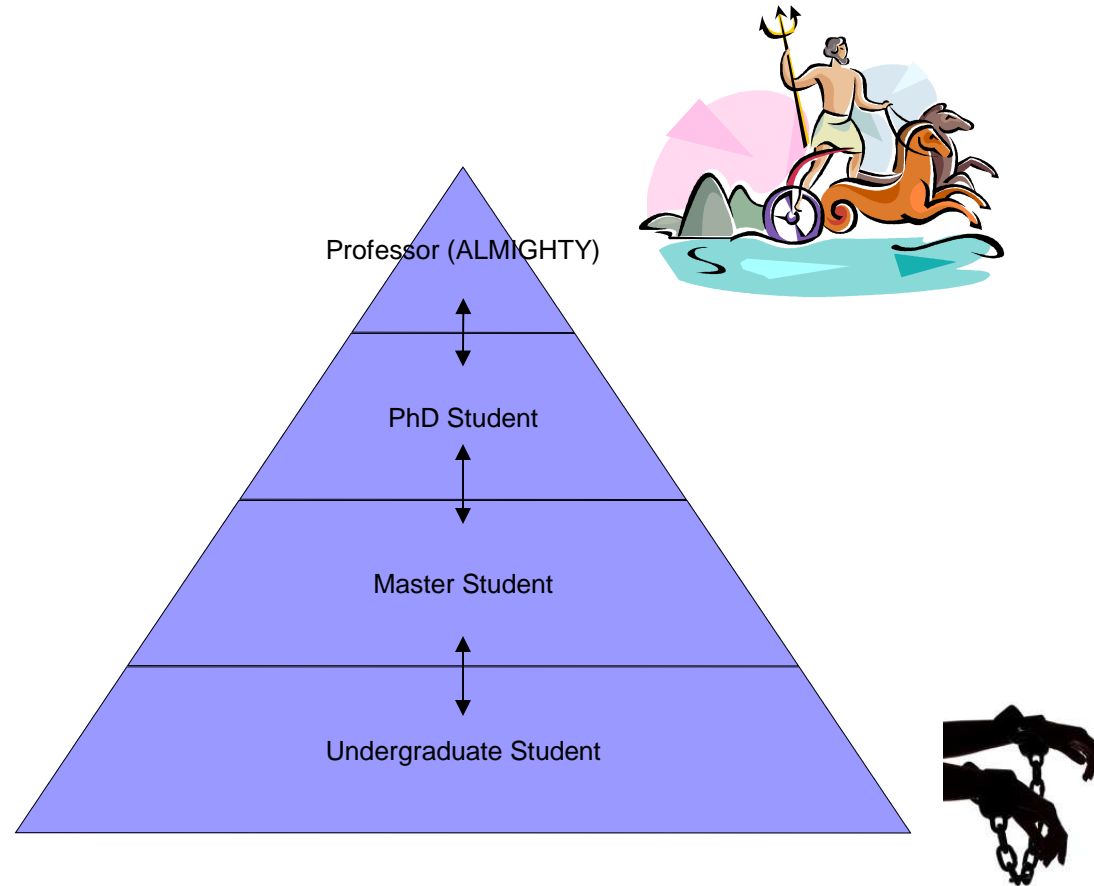
Funding cycle



A piece of the puzzle



Typical scenario



CAHSI/ARG

■ CAHSI

- Computing Alliance for Hispanic Serving Institutions
- Interventions
 - Undergraduate Research
 - ARG
 - Affinity Research Group model
 - Student is tough skills





ARG vs Traditional

Traditional	ARG
Only students with both technical and soft skills will participate.	Some technical background, may lack soft skills, skills deliberately taught and modeled.
Advanced students only	Students with ability to learn or interest
Expert student	Create an expert
No core purpose	Core purpose decides who joins group.

Core purpose?

- Thrive for excellence
- Passionate about work
- Integrity / ethics
- Pillars of character
 - Trustworthiness
 - Respect
 - Responsibility
 - Fairness
 - Caring
 - Citizenship





Johnson Institute Pillars of Character

■ Trustworthiness

- Be honest • Don't deceive, cheat, or steal • Be reliable — do what you say you'll do • Have the courage to do the right thing • Build a good reputation • Be loyal — stand by your family, friends, and country

■ Respect

- Treat others with respect; follow the Golden Rule • Be tolerant and accepting of differences • Use good manners, not bad language • Be considerate of the feelings of others • Don't threaten, hit or hurt anyone • Deal peacefully with anger, insults, and disagreements

■ Responsibility

- Do what you are supposed to do • Plan ahead • Persevere: keep on trying! • Always do your best • Use self-control • Be self-disciplined • Think before you act — consider the consequences • Be accountable for your words, actions, and attitudes • Set a good example for others

■ Fairness

- Play by the rules • Take turns and share • Be open-minded; listen to others • Don't take advantage of others • Don't blame others carelessly • Treat all people fairly

■ Caring

- Be kind • Be compassionate and show you care • Express gratitude • Forgive others • Help people in need

■ Citizenship

- Do your share to make your school and community better • Cooperate • Get involved in community affairs • Stay informed; vote • Be a good neighbor • Obey laws and rules • Respect authority • Protect the environment • Volunteer



Study yourself

Do you share the same core purpose?



Advantage of working in UR

- Develop communication skills
 - Write
 - Present
- Teamwork
- Expert in a topic
- Contact with faculty (mentoring)
- Exposure



Topics



Research Topics

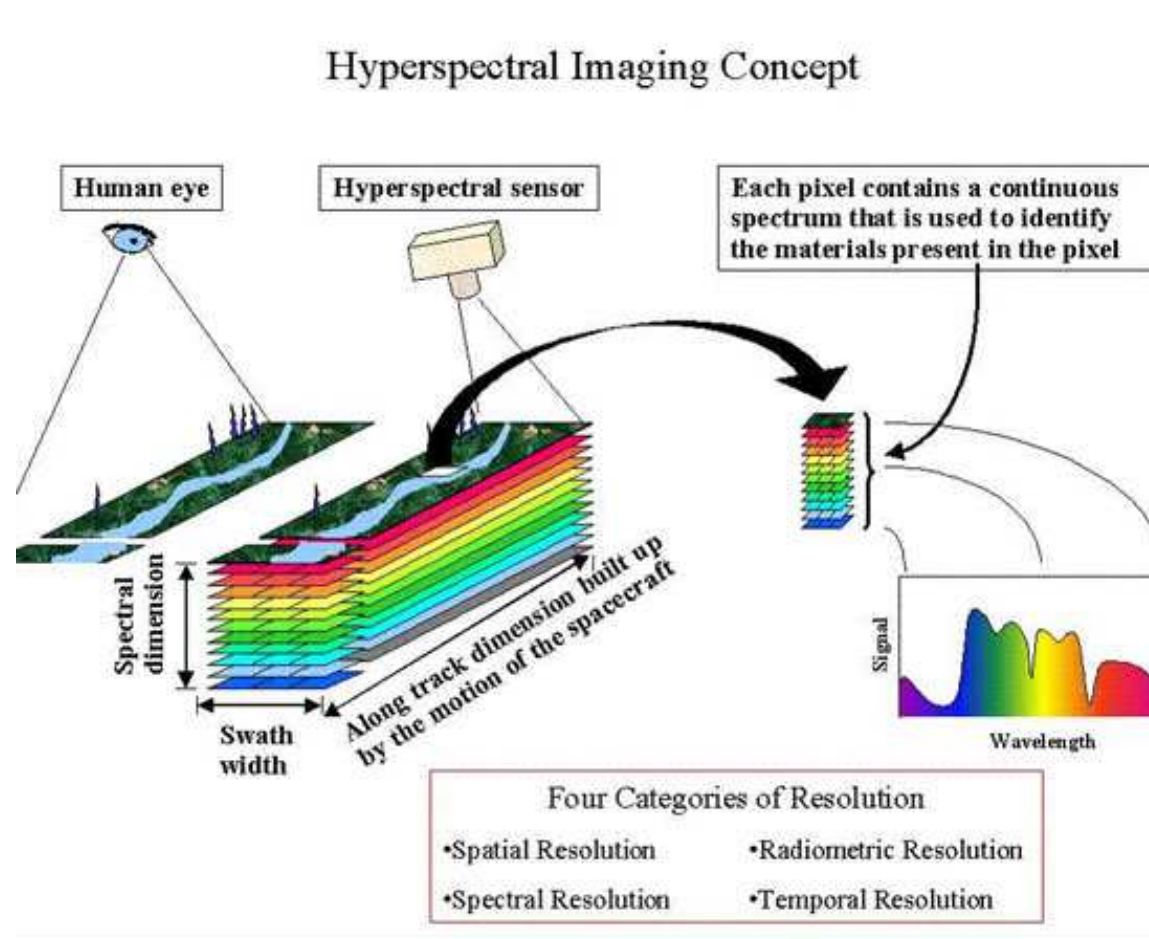
- Hyperspectral images on GPUs and CUDA for detection
 - BIAT
- Hyperspectral algorithms for FPGAs
- Cloud

Research topics

- **CUDA/C/GPU**
 - Hyperspectral Images
 - Detection algorithms
 - GPU
 - Cuda
- **Skills**
 - Program in C
 - Pointers
 - Malloc
 - API
 - Mem management
 - Using external libraries
- **Plus**
 - Linux
 - Repositories
 - Library / SW Eng



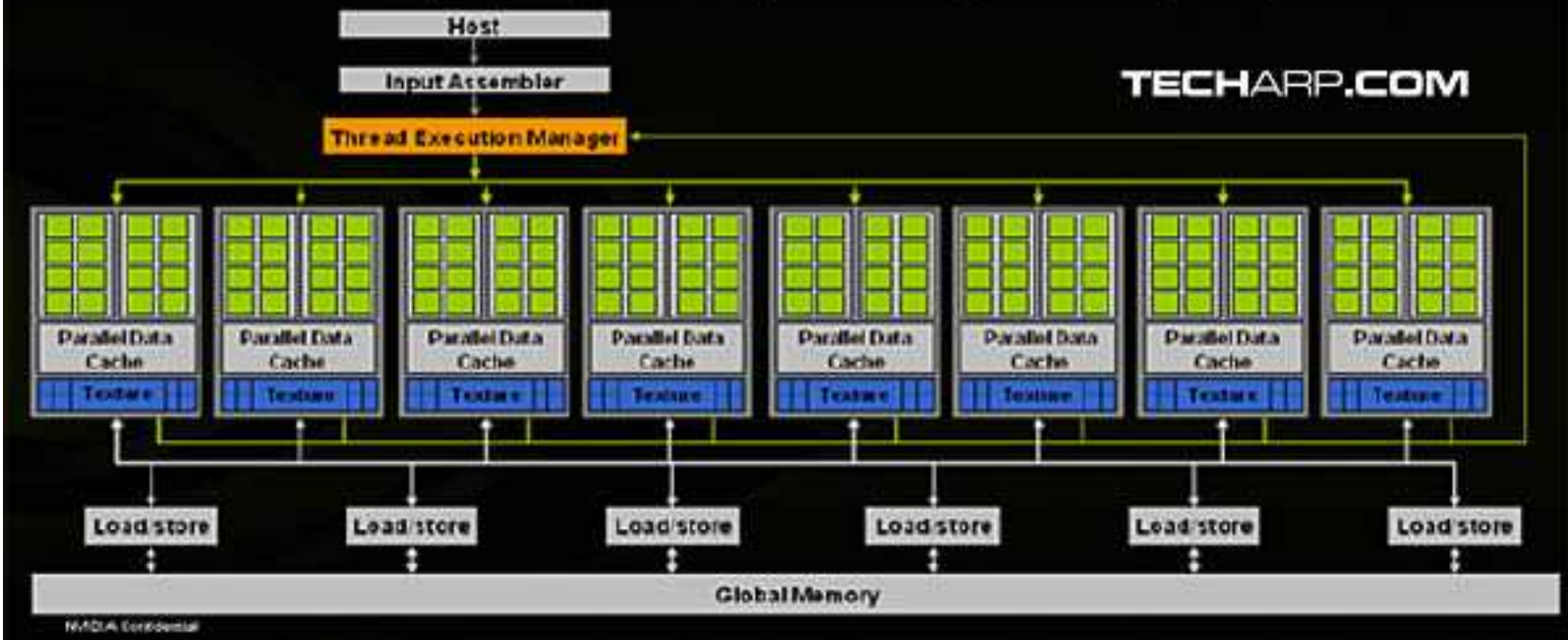
Hyperspectral Image



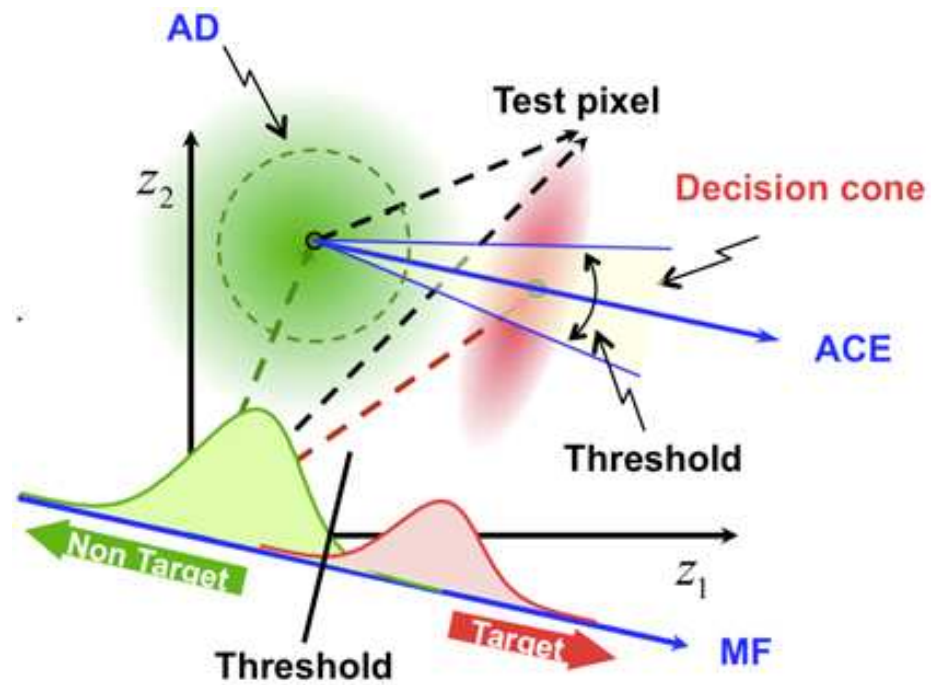
GPU and CUDA

G80 Thread Computing Pipeline

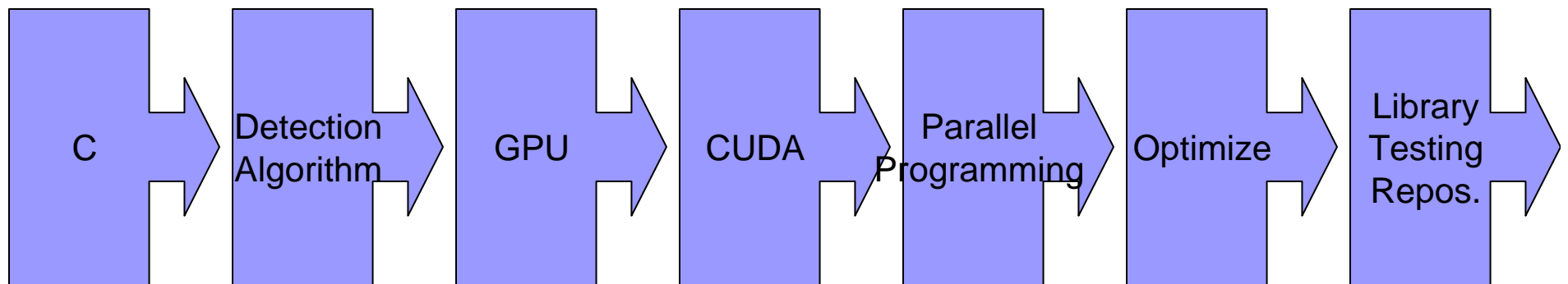
- Processors execute computing threads
- Alternative operating mode specifically for computing



Reed Xiaoli Detection

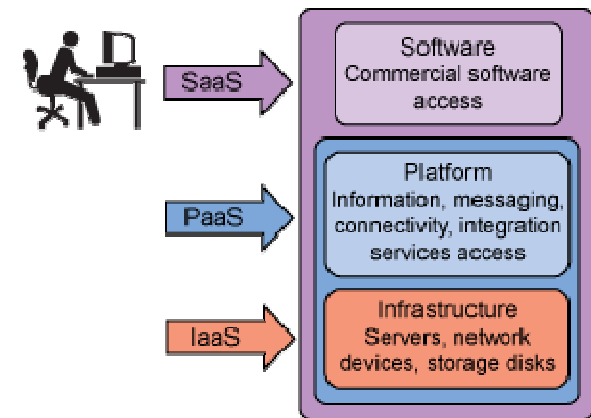
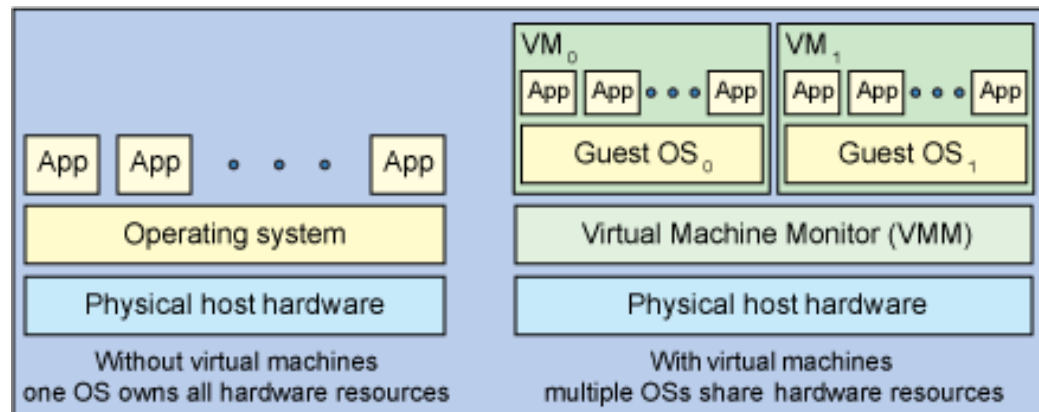


Learning



Cloud Computing

■ Virtual Machine



■ Skills

- Java
- Web Technologies



FPGAs

- Field Programmable Gate Arrays
 - Continuation
 - Abundance Estimation algorithm
 - ISRA
 - Hyperspectral
 - FPGAs
 - Functional Units
- Electronics
 - VHDL/Verilog (HDL)
 - Architecture
 - Digital Design/ synthesis

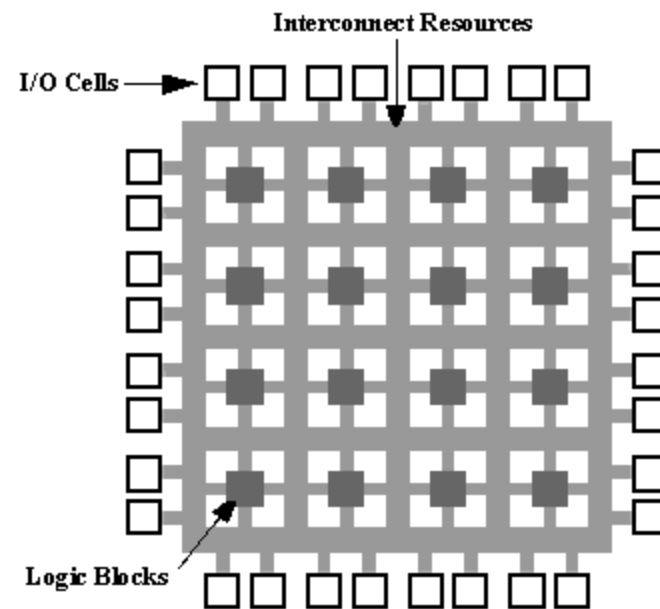
FPGAs

■ Steps

- Create a design
- Logic Components
- Test / verify
- Synthesize

■ Skills

- Electronics
- Digital
- Language (OO)
- Architecture is +





Other

- Nature inspired optimization algorithms
 - Evolutionary algorithms
 - Genetic algorithms
 - **Simulated annealing**
 - Swarm intelligence
 - Ant colony optimization
- Optimize what?
 - Circuit Design



Logistics

The logistics of undergraduate research

- Initial meeting
 - Know each other, develop community of research
- ARG meetings
 - 5 skill development workshops
 - Hands on
 - Suggestion: one Saturday
- Weekly meetings
 - One hour
 - Progress
- Deliverables
 - Mid and final report
 - Happy Hours, Exam (this semester)
 - Posters
 - Paper
 - Presentation
 - Travel (not always)





Meetings

- Computing Research Laboratory
- CRL
 - Rules lab
 - Be nice
 - Access restricted
 - No one else is allowed

My compromise

The screenshot shows a Mozilla Firefox browser window displaying a Google Calendar interface. The browser's address bar shows the URL <https://www.google.com/calendar/render?tab=mc&pli=1>. The calendar is set to the week of November 13-19, 2011, and is displayed in a weekly view. The interface includes a search bar, navigation controls, and a list of calendars on the left side.

Calendar Data:

Day	Sun 11/13	Mon 11/14	Tue 11/15	Wed 11/16	Thu 11/17	Fri 11/18	Sat 11/19
8am	vence membresia sar						
9am		9 - 10:30 Office Hours	9 - 10 Cumpl s Paol 9 - 10 Exame viasitns 9 - 10 Viejito s/GPIJ	9 - 10:30 Office Hours	8:30 - 9:30 HH 2 - sesion 1 9:30 - 10:30 Brian Landron	9 - 10:30 Office Hours	9 - 10:30 Victo - Serv - Bibl 9:30 - 9:30 Bust Dian 9:30 - 9:30 Llev Cale ar
10am			10 - GEM!!! HOY!!				
11am		10:30 - 11:30 Arquitectura ICOM 4215 11:30 - 12:30p Arquitectura ICOM 4215	10:30 - 12p ICOM SW 10:30 - 12p Reunion Facultad	10:30 - 11:30 Arquitectura ICOM 4215 11:30 - 12:30p Arquitectura ICOM 4215	10:30 - 10:30 Bren Seal m 10:30 - 10:30 Grad Seal m 10:30 - 11:30 Women in IT - S227 11:30 - 11:30 Mar bete	10:30 - 12:30 Examen 2 / 10:30 - 11:30 Arquitectur a ICOM 11:30 - 12:30 Arquitectur a ICOM	11 - Canto Diana Alexa
12pm		12:30p - 1:30p Auto - marbete			12p - 1p Almuerzo con Bre Seales 1p - 2:30p Gradcom	12:30p - 12:30p Acepta Reunic Invitaci 12:30p - 12:30p Verifi GPrmi Amar	
1pm		1:30p - 3:30p VM Medico		1:30p - 2:30p Rafael Ramos HH oral midterm Reseach		1:30p - 2:30p Cuda Cesar	
2pm			2p - 3p Nataira 2:30p - 3:30p Gabriel	2:30p - 3:30p CCLI Meetings		2:30p - 3:30p Kaell	
3pm		3:30p - 4:30p Examen CI	3p - 4p David Kaell 3:30p - 4:30p Brian Landron		3:30p - 4:30p Reuniones con Andy (kntshia)	3:30p - 4:30p Recoger nenes	
4pm		4:30p - 5:30p Recoger nenes	4p - 5p Marina Stet... 4:30p - 5:30p Recoger nenes	4p - 5p Recoger nenes	4:30p - 4:30p Bea- Imadin 4:30p - 4:30p Recoger nenes		5p - 6:30p VM Coro 5pm to 7pm
5pm			5p - 6p Recoger nenes	5:30p - 7p DA Jazz 5:1			



Trainings

- Offer trainings
- Available for questions
- Facilities

Requirements

- Time!
 - If you do not have 10 hours a week for research, do not apply.
- Interest and dedication
- Willingness to work
- Respect for others
- Service attitude
- Basic Skills (more)





Basic Skills

■ GPU/CUDA

□ Program in C

- Pointers, Malloc, API, Mem management, Using external libraries

- Plus

- Linux, Repositories, Library / SW Eng

■ FPGAs

□ Digital, logic circuits, programming

□ Plus: VHDL or Verilog, Architecture

■ Cloud

□ Servers

□ Java

□ Web Technologies (HTML, CSS, Javascript)

□ Linux



Selection for research

- Resume
- Transcript
- Diagnostic Exam
 - January 10-12, 2011
 - Test skills related to your work



Questions

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- Stefani 413